Defense Manufacturing Conference

Aircraft Sector Industrial Overview

December 3, 2009

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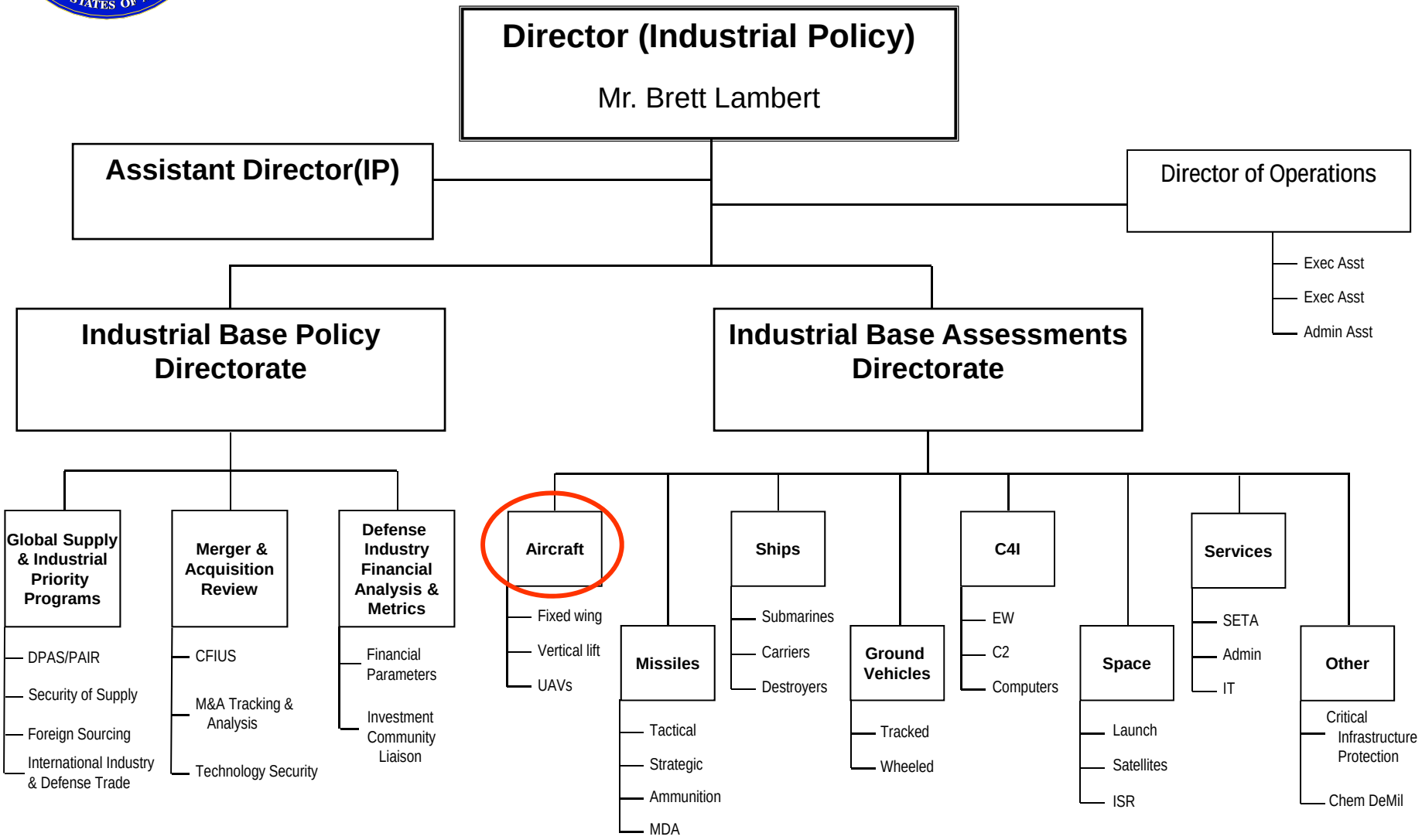
Office of Industrial Policy



Aircraft Sector

- The aircraft industrial base produces fighter/attack aircraft, vertical lift aircraft, transport/cargo aircraft, large fixed wing aircraft (i.e., aerial refueling tanker, Intelligence, Surveillance, and Reconnaissance (ISR), and multi-mission aircraft), trainers, and unmanned aerial systems.

Aircraft in Sector

- Fighter/Attack
  - F-22A Raptor
  - F35 Lightning II
  - F/A-18E/F Super Hornet
- Vertical Lift
  - V-22 Osprey
  - AH-64 Apache Longbow
  - CH-53K
  - VH-71 Presidential Helicopter
  - CH-47F Chinook
  - UH-60M Blackhawk Upgrade, MH-60R, MH-60S
  - H-1 Upgrade Program








Aircraft in Sector

- Unmanned Aerial Vehicles
  - Global Hawk, *Predator, Firescout, Eagle Eye, Hawk*
- Transport/Tanker/Special Missions
  - KC-X
  - C-17 Globemaster
  - C-130 Hercules
  - C-5 Reliability Enhancement and Reengineering Program
  - P-8A Multi-Mission Maritime Aircraft
  - Joint Primary Aircraft Training System (JPATS)
  - T-45 Goshawk
  - E-2 Hawkeye
  - B-2 Radar Modernization Program (RMP)







Aircraft in Sector

- Emerging DoD Aircraft Programs
  - Light Utility Helicopter (LUH)
  - Heavy Lift Replacement
  - Joint Cargo Aircraft
    - Production planned for FY10 for 180 aircraft
  - Broad Area Maritime Surveillance (BAMS)
    - Full operating capability projected for FY17
  - Navy Unmanned Combat Air Systems (UCAS)
  - Aerial Refueling Tanker (RFP release FY09)
  - Next Generation Long Range Strike
  - E-10A







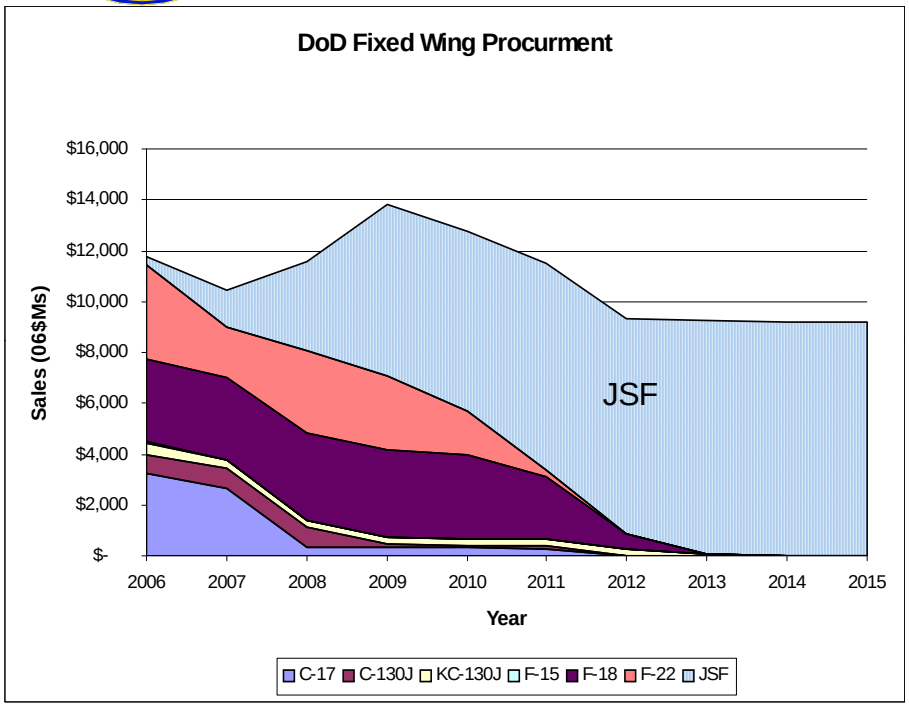
Aircraft Sector Assessment

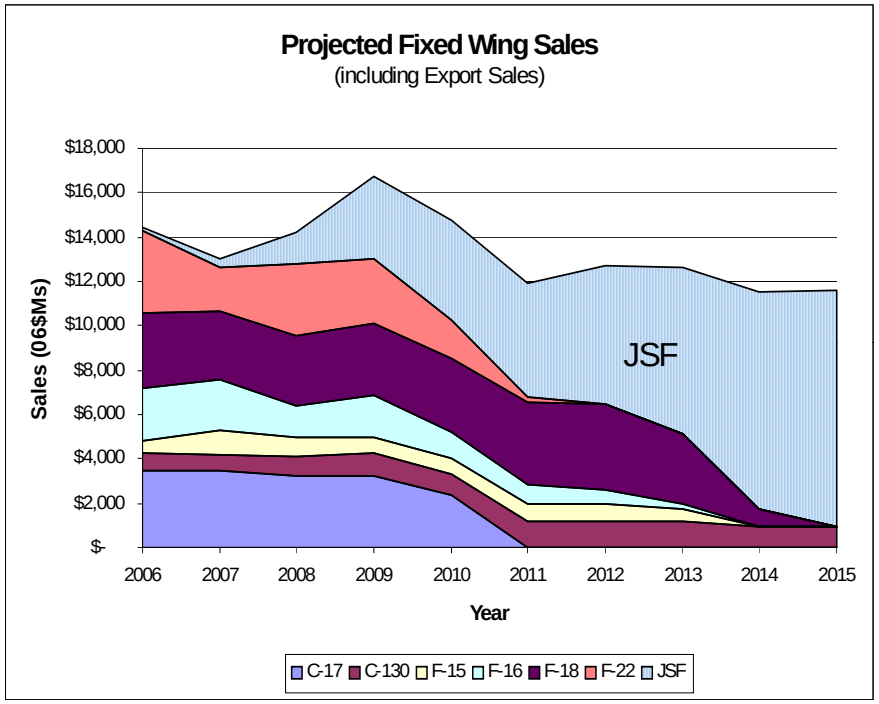
- U.S. defense and aerospace companies have maintained their financial health
- Existing large backlogs have decreased but continue to provide a buffer
  - Boeing announced that their back log now stands at $320 billion, nearly five times their current annual revenue
- Even with substantial backlogs many companies are still aggressively managing infrastructure costs and investments in an effort to remain competitive coming out of the economic downturn.
  - Bell, with the loss of ARH on top of the economic downturn, has cancelled some planned facilities growth in an effort to align orders more closely with capacity.

Aircraft Sector Assessment Overview (cont)

- Correspondingly, DoD has not seen any failures from critical 2nd or 3rd tier aviation suppliers.
  - Some lagging supplier health indicators have shown increased cost and schedule variances that have proven manageable so far.
- Further impacts to the supplier base health issue will depend heavily on the length of the continuing economic downturn and depth of subsequent budget cuts.

Procurement Trends: Addressing the "Fighter Gap"



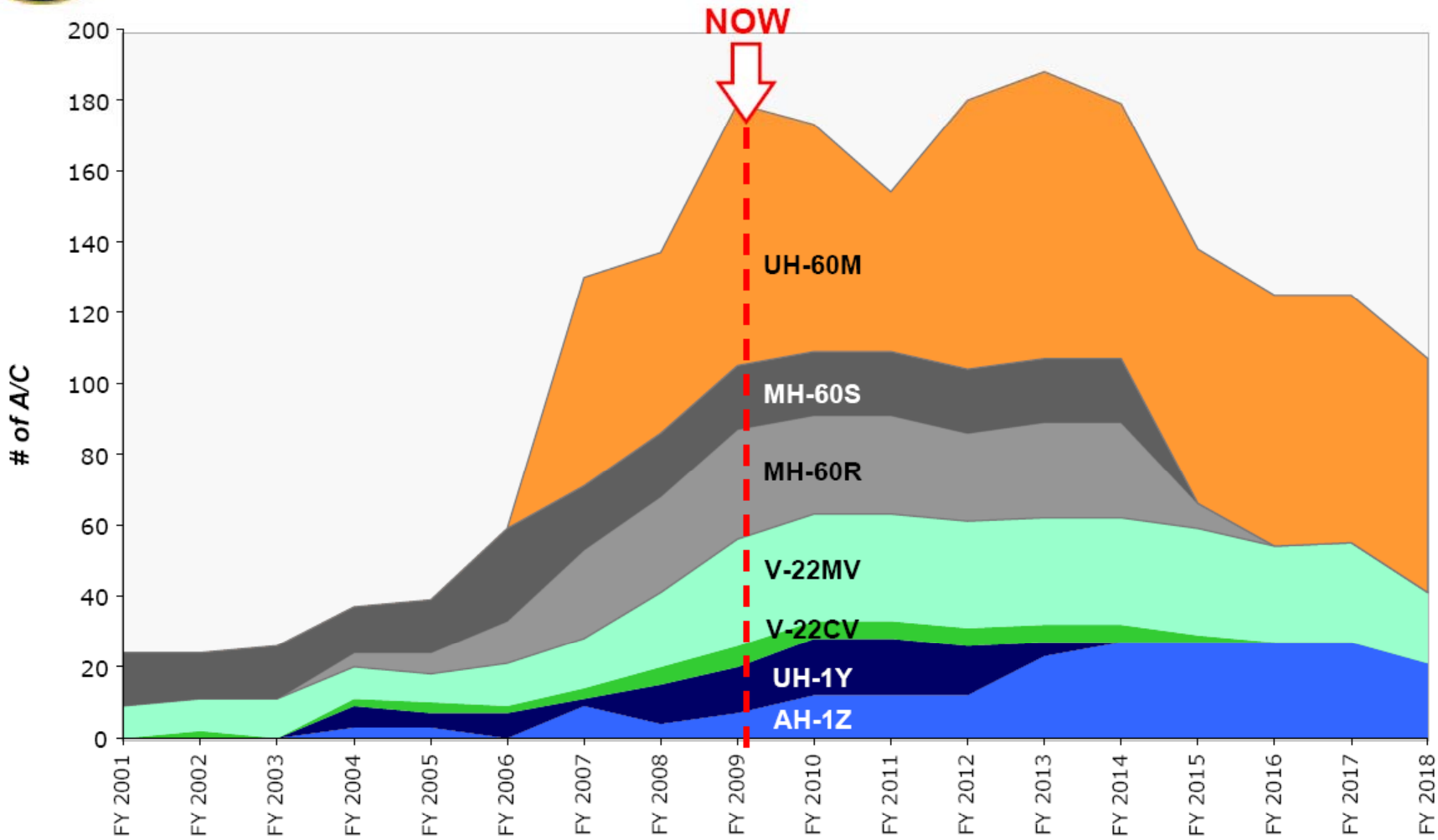


- Recapitalization effort continues with the demand for new or upgraded aircraft remaining strong.

- Trend is to accelerate programs into production to speed the overall recapitalization effort over new development and innovation.

- Five major prime contractors have procurement orders from the Department of Defense for the next ten years. Lockheed Martin and Sikorsky have programs identified today that will carry production for the next 20 years.

Major Production Ramps Are Underway

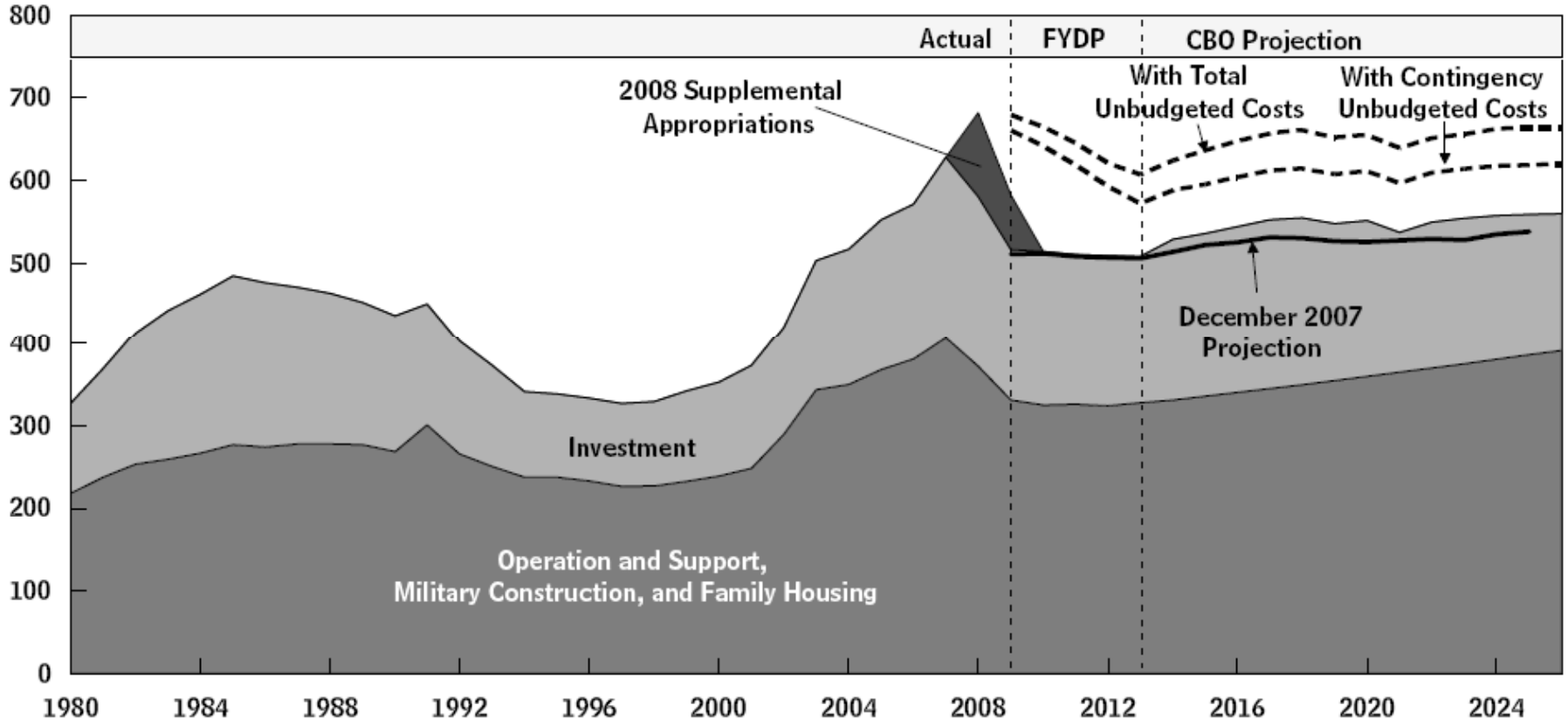


Defense Budget Trends

(DoD Budget Authority)

Past and Projected Resources for Defense

(Billions of 2009 dollars)

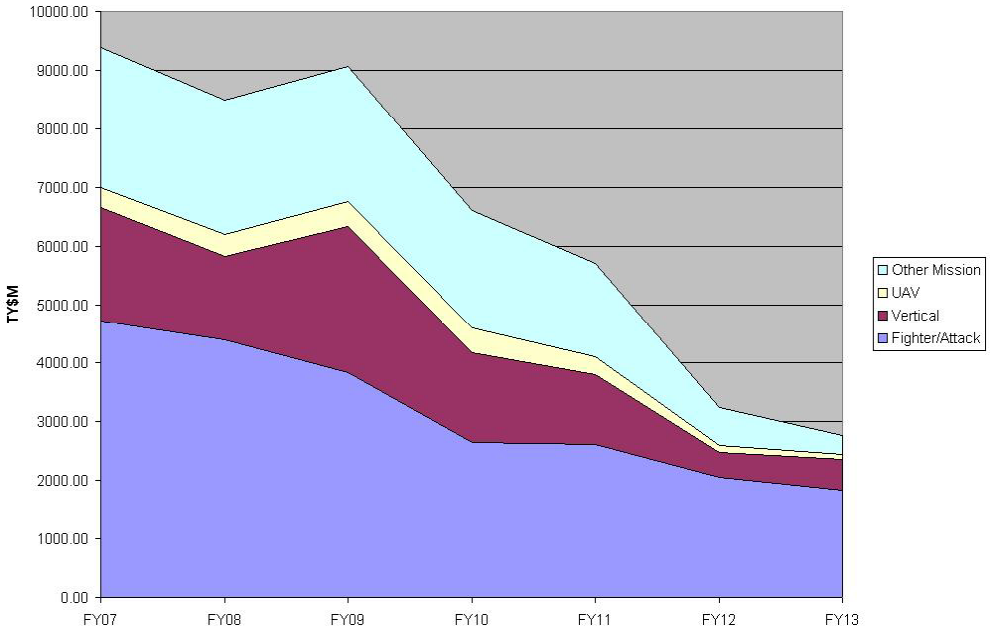


Source: Congressional Budget Office.

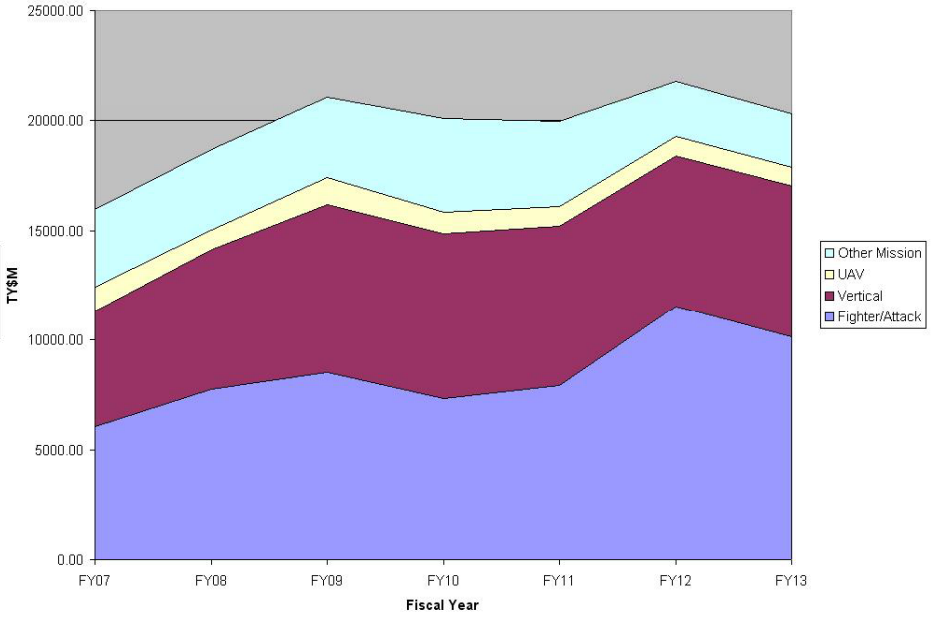
Note: FYDP = Future Years Defense Program.

DoD Aircraft Funding Trends

RDT&E Funding Trends FY06 – FY11

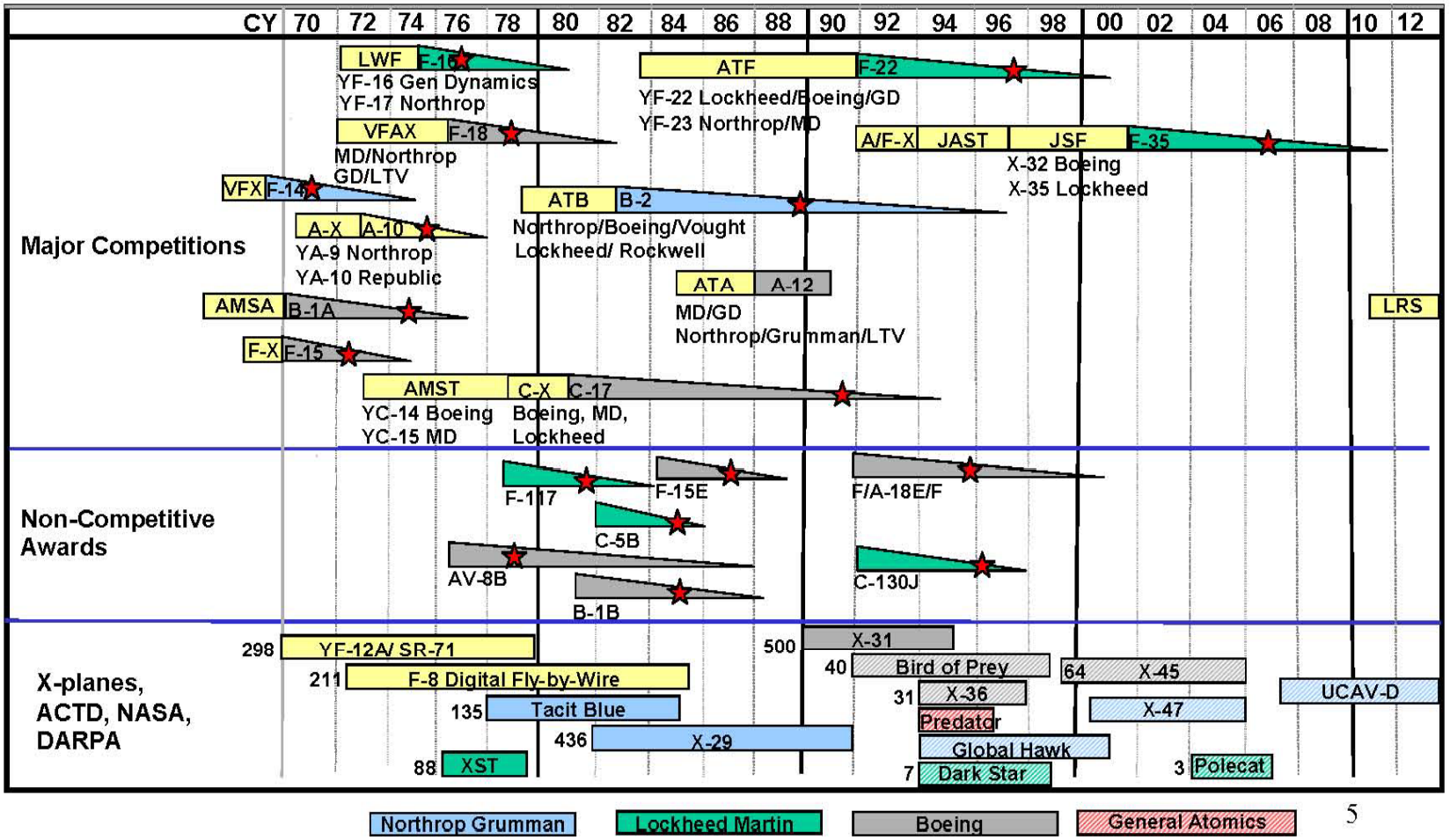


Procurement Funding Trends FY06 – FY11



DCMA
Defense Contract Management Agency

Major Military Fixed-Wing Aircraft Design & Development Programs



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Problem Statement

- "If there are no new development programs, the Fixed-wing & Rotary-wing industry will continue to lose its capability to be able to design and produce a new generation aircraft. The lack of varied production orders and limited development efforts for the next decade is not conducive to the long-term well-being of the industry."

Unique Military Aircraft Requirements

Combat Maneuver

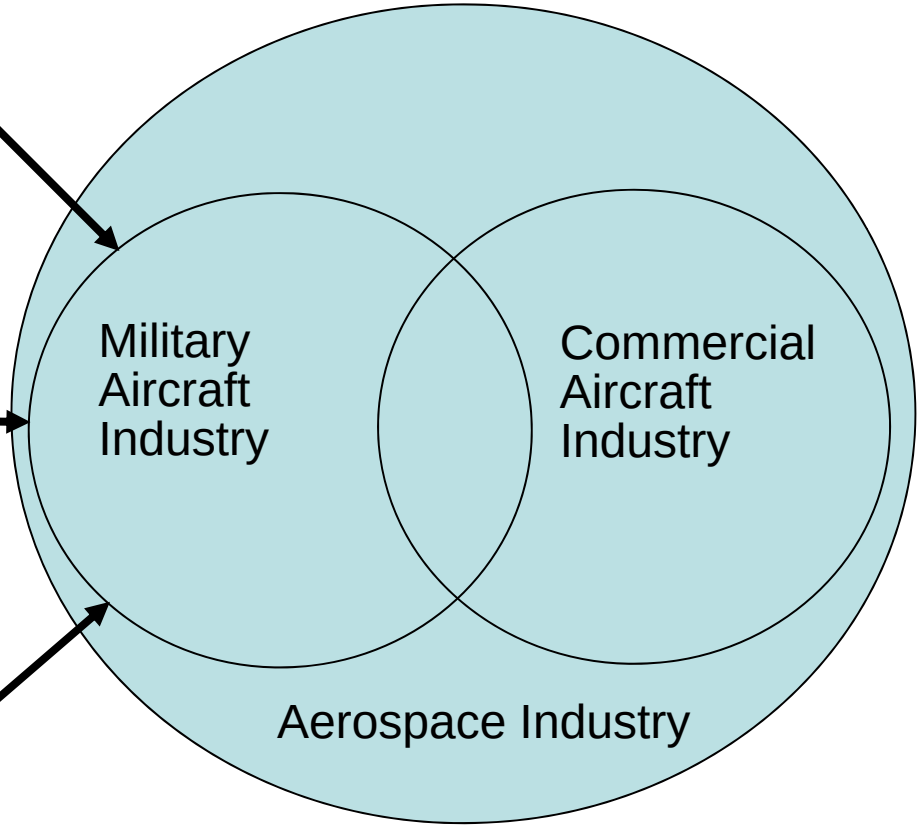
- Transonic/Supersonic
- High Angle of Attack
- High g Structures
- Thrust Vectoring
- Hypersonic
- STOL/STOVL
- Carrier OPS
- High Altitude

Survivability

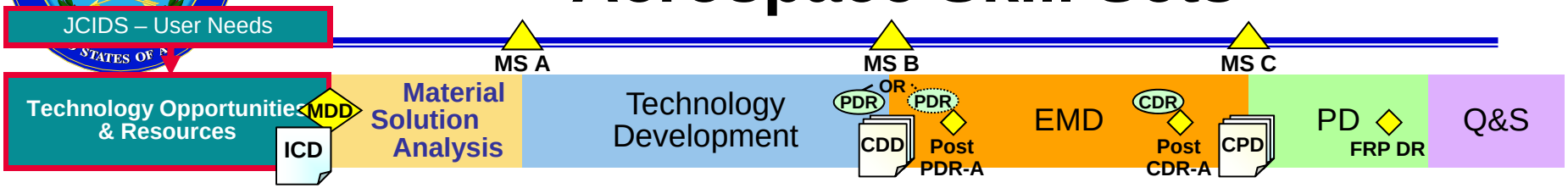
- Low Observable
- Egress Systems
- Ballistic Tolerant Structures
- Fire Detection & Suppression
- EW/ECM
- RAD Harden

Weapons Integration

- Target Acquisition
- Stores Management
- Weapons Separation

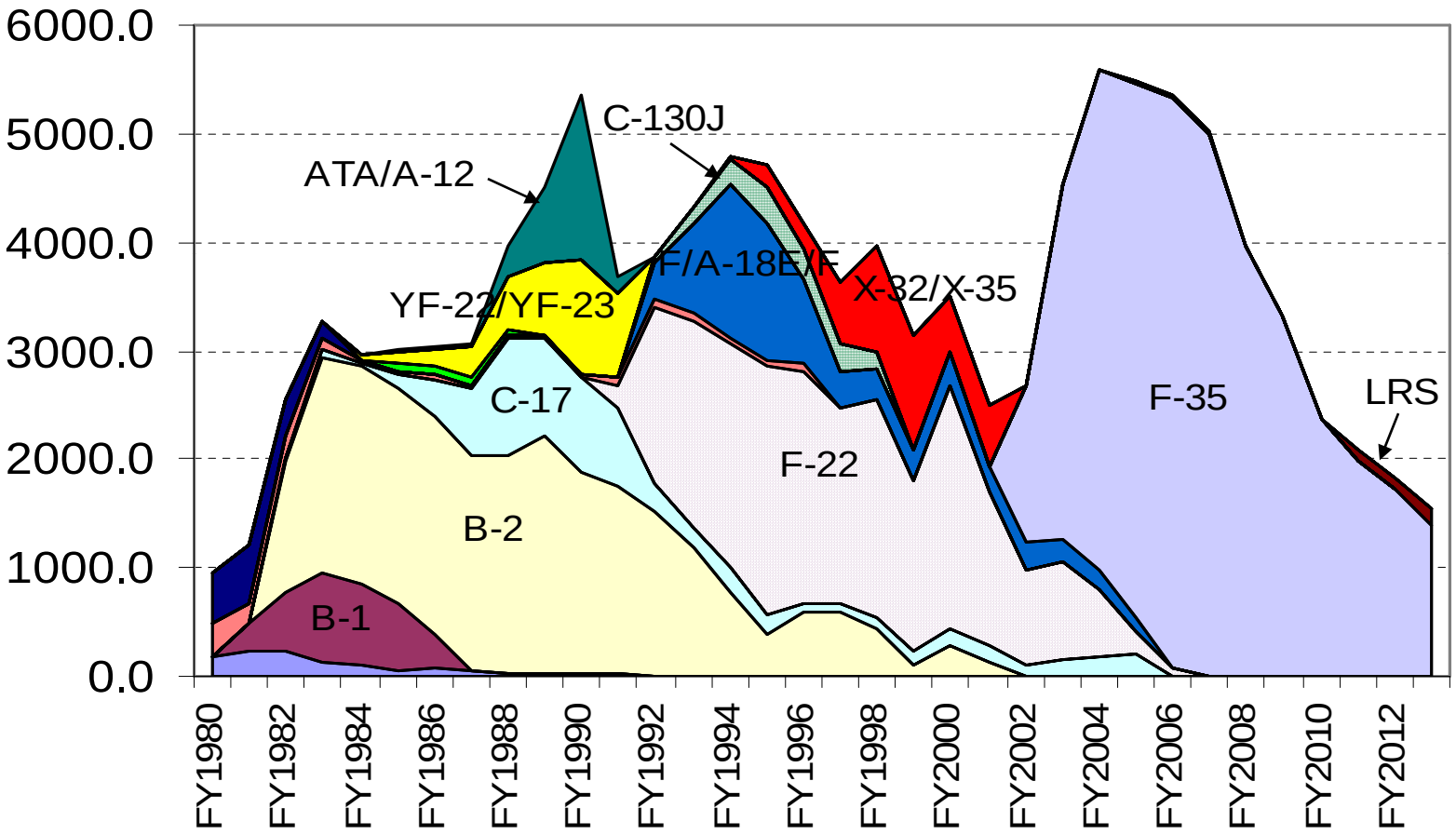


Acquisition Timeline & Required Aerospace Skill Sets



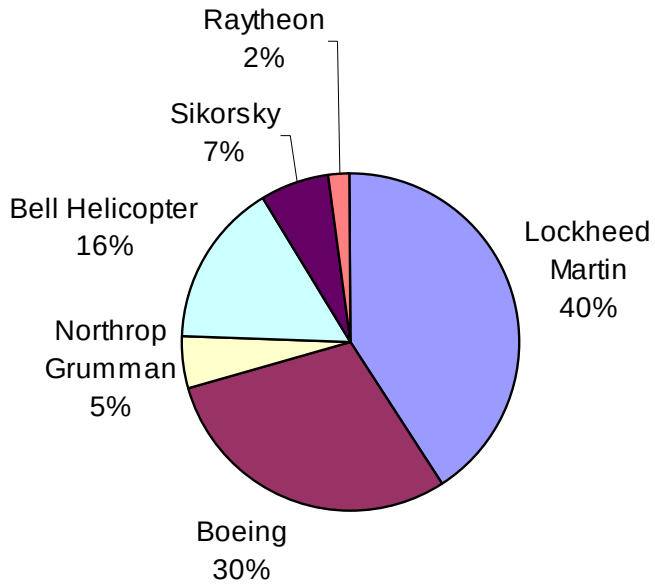
Technology Opportunities & Resources	Material Solution Analysis	Technology Development	EMD	PD	Q&S
• Modeling & Simulation • Flight/Platform Configuration • Systems Engineering • Materials and Processes Engineering • Systems Analysis and Concept Definition • Aerodynamics and Flight Controls • Propulsion, Configuration Design and Weights	• Materials, Processes and Physics Engineering • Mechanical/Structural Engineering • Electrical Engineering • Electronics Design and Analysis • Software Engineering • Systems Analysis and Concept Definition • Aerodynamics and Flight Controls • Propulsion, Configuration Design and Weights	• Mechanical/Structural Engineering • Product Life-Cycle Management • Software Engineering • Materials and Processes Engineering • Electronics Design and Analysis • Systems Analysis and Concept Definition • Aerodynamics and Flight Controls • Propulsion, Configuration Design and Weights • Systems Assurance Engineering	• Flight Test Engineers • Ground Test Eng • Mechanical/Structural Engineering • Software Engineering • Systems Assurance Engineering • Electronics Design and Analysis Aerodynamics and Flight Controls • Propulsion, Configuration Design and Weights • Materials, Processes and Physics Engineering	• Flight Test Eng • Product Life-Cycle Management • Manufacturing Integration and Support Engineering • Electronics Design and Analysis Mechanical/Structural Engineering • Materials and Processes Engineering • Define/Operations Integration • Systems Engineering • Supplier management	• Logisticians • Support Eng • Field Services • Product Life-Cycle Management • Manufacturing Integration and Support Engineering • Software Engineering • Electronic System Design Engineering • Electronics Design and Analysis Engineering • Mechanical/Structural /Electrical Engineering • Systems Engineering • Supplier Management

Manned Fixed Wing Military Aircraft* RDT&E ($M)

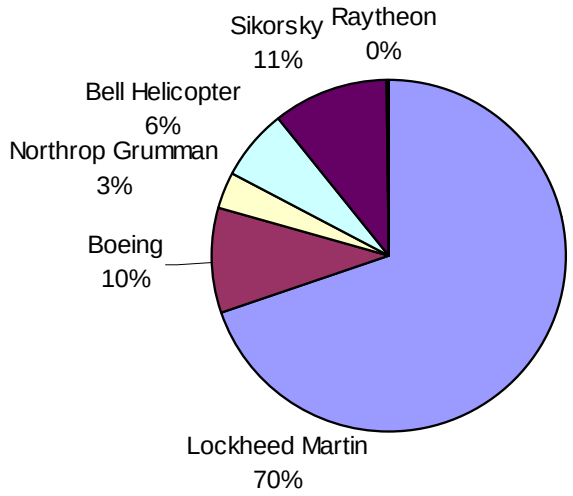


* Excludes derivative aircraft

Procurement Funding Distribution



FY06-FY11



To Complete*

Procurement funding beyond FYDP

- Lockheed Martin – Joint Strike Fighter
- Sikorsky – Heavy Lift Replacement, UH-60M

•With the shutting down of the F-22 and soon the F/A-18E/F/G production, there is concern for the loss of essential military unique design and engineering capabilities

* Based on current MDAP program funding in DAMIR

Aircraft Sector Critical Suppliers

		Airframe					Propulsion			Electronics							Subsystems								
		Northrop Grumman	BAE Systems (UK)	Vought	GKN Aerospace (US)	Fokker Stork Aerospace (NL)	Pratt & Whitney	General Electric	Rolls Royce (US and UK)	Honeywell	Rockwell Collins	BAE Systems (US and UK))	Smiths Industries (US and UK)	Northrop Grumman	Raytheon	Thales	Goodrich	Messier-Dowty (UK)	Martin Baker (UK)	GKN Aerospace (US)	Sierracin	PPG	Hamilton Sundstrand	Smiths Industries (US and UK)	Moog
Contractor	**Program**																								
Lockheed Martin	F-22A	x		x	x		x			x	x	x		x	x		x			x	x			x	x
	F-35	x	x	x	x	x	x	x	x	x	x		x	x	x		x		x	x				x	x
	C-130J			x					x	x	x	x					x						x	x	
	VH-71				x				x	x						x								x	x
	C-5			x				x		x	x		x				x						x		x	x
Boeing	F/A-18	x			x			x		x	x	x	x	x	x		x	x		x	x		x	x	x	x
	CH-47F									x	x	x		x		x						x		x	x
	AH-64D				x			x		x	x	x										x		x	x
	P-8 (MMA)									x	x		x												
	T-45TS								x	x	x		x				x	x					x		
	C-17A			x		x	x			x	x	x		x			x					x	x	x	
Northrop Grumman	Global Hawk			x					x	x		x	x		x		x								
	E-2			x					x	x	x	x					x						x	x	
	B-2			x				x		x	x	x					x					x			x
Bell Helicopter	H-1 Upgrade							x		x	x	x		x	x	x								x	
	V-22			x					x	x	x	x			x			x				x	x	x	x
	ARH										x			x											
Sikorsky	MH-60S			x				x		x	x			x	x		x					x		x	
	UH-60M			x				x		x	x	x			x		x					x		x	x
Raytheon	JPATS						x			x					x				x	x				x	

* Critical defined as long lead items

Issues to Sustaining a cost effective, reliable and sufficient Defense Industrial Base

- Workforce
- Number/frequency of New Development Programs
- Requirements definition timeline

Workforce Issue

- Military aircraft design and development workload (unclassified) is at a historic low
- PresBud identifies outyear requirements for 2 new combat aircraft programs and no new development helicopter program
- Study efforts in work (co-sponsored by IP, Air Force, and Navy) to determine if there is sufficient military design and development activity to sustain core competencies required for the next generation of combat air vehicles?

Number/frequency of New Development Programs Issue

•Possibility of insufficient number/frequency of new development programs to sustain military unique engineering competencies DoD will require in the future

•Potential for few new program starts leading to…
- Significant skill/experience loss expected as aging R&D workforce retire
- Limited Competitive opportunities

•Technology Maturation efforts underway for other programs, however, funding constraints are driving PM's to down-select to a single source early in the technology maturation/risk reduction phase.

•*If at all possible*, DoD would like to consider funding at least two competitive teams during the technology maturation/ risk reduction process.

•Benefits: (1) Reduces risk by developing multiple solutions to technical challenges
(2) Preserves competition later
(3) Opportunity to re-capitalize the aging R&D workforce

Requirements Definition Timeline Issue

- Timeline of DoD's requirements definition process often leaves industry inadequate time to respond

- Increasing technical complexity of each succeeding generation of military aircraft require years of technology maturation/risk reduction effort
  - Technical requirements and acquisition strategies for LRS and NUCAS/F/A-XX programs still largely undefined
  - Industry hesitant to commit IRAD until clear requirements and an acquisition strategy emerge

- *If at all possible:*, DoD should develop a comprehensive Military Aircraft Roadmap that provides a 20 year look ahead at major research, design, development and acquisition objectives based on strategic direction issued in the QDR.

Summing up the Issues

- It is about Atrophy and Loss of Key Design and Development Capabilities
  - Military aircraft design and development workload is at a historic low and RDT&E funding is expected to continue to decrease across the FYDP.
  - Issues faced by the aviation industry include an aging workforce and decreased likelihood that a younger engineering workforce will remain due to the lack of new challenges.
  - Inadequate funding has been identified to encourage innovation and to mitigate risk taking through company sponsored R&D activities.
- There is also a growing need to address shortages in specific critical skill sets
- This is necessary to ensure a full range of competencies will continue to exist to design, develop, prototype, produce and sustain new platforms and systems needed to explore new concepts and innovate.

Sector Summary

- Aircraft Industrial Base short term is in good shape

- Aircraft topline funding appears both steady and strong but doesn't tell the whole story
  - Procurement funding remains relatively steady over next 10 years
    - LM & Sikorsky have production programs for next 20 years
  - RDT&E funding steadily decreases across FYDP – from $11B in FY06 to $4B in FY11 (63% decrease)

- Military aircraft design and development workload is at a historic low
  - Current vertical lift path will not achieve DoD's desire long term objective. Certain path to the status quo
  - Study efforts in work to determine if there is sufficient military design and development activity to sustain core competencies required for the next generation of combat air vehicles?